



August 13, 2021

**By ECFS**

Marlene Dortch, Secretary  
Federal Communications Commission  
45 L Street NE  
Washington, DC 20554

Re: **Notice of Oral *Ex Parte* Presentation; GN Docket No. 18-122**

Dear Ms. Dortch:

On August 12, 2021, representatives from the following companies and associations within the aviation and aerospace industry (the “Representatives”) – the Aerospace Industries Association, the Aerospace Vehicle Systems Institute, Airlines for America, American Airlines, the Air Line Pilots Association, International, Aviation Spectrum Resources, Inc., the Boeing Company, Collins Aerospace, Garmin International, the General Aviation Manufacturers Association, Helicopter Association International, Honeywell International Inc., and Lockheed Martin Corporation – held a virtual meeting over Teams with William Davenport, Chief of Staff & Senior Legal Advisor for Wireless and International to Commissioner Geoffrey Starks.<sup>1</sup>

The Representatives used the meeting to demonstrate the need for grant of the aviation and aerospace industry Petition for Reconsideration of the Commission’s March 2020 *Report and Order* in the above-captioned proceeding and take measures to ensure aviation and public safety by protecting radio altimeters from harmful interference from 3.7 GHz licensed operations.<sup>2</sup> The need for such relief is supported by the October 2020 compatibility report prepared by the multi-stakeholder group formed following the FCC’s *Report and Order* under the auspices of RTCA Special Committee 239 (“MSG Report”), which found that the 220 megahertz frequency separation between the flexible use band

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<sup>1</sup> See Attachment 1 for the list of Commission and aviation and aerospace industry meeting participants.

<sup>2</sup> Eleven aviation and aerospace industry stakeholders filed a Petition for Reconsideration of the Commission’s March 2020 3.7 GHz Band Report and Order, which remains pending, that asks the Commission to take into account further developed evidence, such as the MSG Report, and institute appropriate mitigations to ensure aviation and public safety is preserved while 3.7 GHz flexible use operations are deployed. See Petition for Partial Reconsideration of the 3.7-4.2 GHz Band Report and Order filed by the Aerospace Industries Association (“AIA”) et al., GN Docket No. 18-122 (May 26, 2020) (“Petition to Ensure Aviation Safety”); see also *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343 (2020) (“Report and Order”), *petitions for reconsideration pending*.



(3700-3980 MHz) and the radio altimeter band (4200-4400 MHz) falls well short of protecting radio altimeters given the flexible use power levels permitted under the rules adopted in the *Report and Order*. To address this, the Representatives asked the Commission to convene and oversee (jointly with the Federal Aviation Administration (“FAA”)) a forum and process involving the aviation and aerospace industry and the 3.7 GHz Band flexible use licensees with the goal of government and industry developing complementary solutions that allow 5G to advance without inflicting undesired impacts on use of the National Airspace System.

To be effective, the Representatives explained why these solutions must include some mitigations implemented by the 3.7 GHz licensees by December 5, 2021, when their operations begin to roll out in the 46 largest Partial Economic Areas in the contiguous U.S. The Representatives underscored that the aviation industry has been diligently examining the mitigations it or the FAA can initiate without the Commission or the 3.7 GHz Band flexible use licensees assuming an active role. However, while some of these mitigations may be part of a long-term solution, the bottom line is that aviation-initiated mitigations that have been identified require complementary flexible use licensee-implemented mitigations to close the “mitigation gap” and avoid serious disruptions to current aviation operations of all types in the short and medium terms. For instance, adding band pass filters to certified aircraft in a timely fashion – before 3.7 GHz Band deployments start operating in major markets – is a practical impossibility<sup>3</sup> and fails to offer a comprehensive solution to mitigate the risks of interference to radio altimeters. In any event, adding such filters to radio altimeter installations will do nothing to address the risk of interference from potential flexible use spurious emissions into the 4200-4400 MHz band demonstrated by the MSG Report. Thus, until long-term solutions can be implemented by the aviation and aerospace industry, the industry has determined in good faith that closing the mitigation gap is not possible without the flexible use licensees being required to take their part. Without appropriate mitigation measures taken by 3.7 GHz flexible use licensees to reduce sufficiently the potential for harmful interference to radio altimeters, the result is likely to be substantial disruption to the use of the National Airspace System. This will adversely impact the flying public, the economy, and critical aviation services.

To illustrate the prospective impacts, the Representatives discussed several real-world examples, such as air ambulances arriving in a large medical center with multiple heliports. Analysis shows that flexible use base stations, that implement no mitigations to protect radio altimeters from harmful interference, have the potential to wreak havoc on the use of heliports at hospitals and in medical centers, as well as at the countless

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<sup>3</sup> Even ignoring the severe economic impact of COVID-19 on the civil aviation industry, the timeline to design, certify, and install even the most basic of filters is materially longer than the time between issuance of the *Report and Order* in March 2020 and the December 5, 2021, date when the lowest 100 megahertz of the 3.7 GHz Band are expected to become available for operation by flexible use licensees in many large markets in the U.S.



random offsite locations, such as medical response scenes, where helicopters frequently land in first responder situations. The Representatives explained that the large number of heliports in the U.S., and much larger number of helicopter flights annually, demonstrates that harmful interference to radio altimeters on helicopters has a significant likelihood of happening without elimination of the “mitigation gap.”

Scenarios regarding the impacts of harmful interference to large commercial transport and other aircraft in various landings and approaches conditions were then raised by the Representatives. They explained that such harmful interference could lead to an escalation of negative outcomes, from missed approaches, delays, diversions, and flight cancellations, to the shutting down of runways on an indefinite basis. Further, the Representatives discussed the critical role of accurate radar altitude during escape maneuvers that can be required by large commercial air transport and other aircraft during wind shear events and that occur near the ground. Loss of, or incorrect, radar altitude due to flexible use interference would greatly reduce chances of a successful safe outcome.

The Representatives concluded and reiterated that the Commission should, jointly with the FAA, promptly convene and actively oversee discussions involving the aviation and aerospace industry and 3.7 GHz Band flexible use licensees with the goal of developing solutions in the near and medium term – meaning until long term solutions can be implemented in the form of new aviation standards, new certifications of radio altimeter equipment consistent with those standards, and equipping aircraft with that equipment, which will take a number of years – that allow the 5G industry to advance without inflicting undesired impacts on use of the National Airspace System. The Representatives explained that previous efforts by aviation and aerospace industry to pursue mitigation solutions with the commercial mobile wireless industry after the MSG Report, and with the imminence of the 3.7 GHz Band flexible use in December 2021, have failed. To meet the necessary timelines of both industries, the Commission and FAA should step in, each in the dual roles of mediator and regulator, to engineer appropriate complementary solutions with the two industries to keep aviation and public safety – as well as ubiquitous aeronautical capacity at the high levels the nation’s citizens, businesses, and institutions have come to expect and on which they rely – as 3.7 GHz Band operations begin to roll out.



Pursuant to Section 1.1206(b) of the Commission's rules, this letter is being filed electronically along with a copy of the PowerPoint materials presented at the meeting as Attachment 2.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Karina Perez", is positioned below the "Respectfully submitted," text.

Karina Perez  
Director, Unmanned and  
Emerging Aviation  
Technologies

Attachments

cc: William Davenport  
Jazmin Bejarano

## **APPENDIX 1**

### **August 12, 2021, Participants in Meeting in GN Docket No. 18-122 between Representatives of the Aviation and Aerospace Industry and Commission Staff**

#### **Aviation and Aerospace Industry Participants**

##### Aerospace Industries Association

Karina Perez  
Chelsea Slater

##### Aerospace Vehicle Systems Institute

David Redman

##### Airlines for America

Robert Ireland

##### Air Line Pilots Association, International

Edward Hahn  
Bryan Lesko  
Bob Fox

##### American Airlines

Wes Googe

##### Aviation Spectrum Resources, Inc.

Andrew Roy

##### The Boeing Company

Joseph Cramer  
Kim Kolb

##### Collins Aerospace

Edward A. Yorkgitis, Jr.,  
Kelley Drye & Warren LLP,  
Counsel for Collins Aerospace

##### Garmin International

Clay Barber

##### General Aviation Manufacturers Association

Jonathan Archer  
Jens Hennig

Helicopter Association International

John Shea

Emma Taylor

Honeywell International

Seth Frick

Lockheed Martin Corporation

Ryan Terry

**Federal Communications Commission Participants**

Office of Commissioner Geoffrey Starks

William Davenport

Jazmin Bejarano



# Action Needed to Close Radio Altimeter Mitigation Gap and Protect Aviation and Public Safety

Coalition of Aviation and Aerospace  
Stakeholders

Meeting with the Office of FCC  
Commissioner Starks

August 12, 2021



# The Need for Prompt Government and Industry Action to Ensure Aviation and Public Safety Is Clear

- The RTCA MSG Report demonstrates the clear potential for substantial levels of interference to radio altimeters on aircraft of all types over a wide range of operational scenarios and altitudes encountered by aviation operations daily.
  - The CTIA and 5G Americas critiques are based upon best cases that wholly disallow the real world variability in aircraft operations and equipment performance.
    - The critiques also completely overlook the substantial potential for 5G spurious emissions into safety-of-life radio altimeter operations that only 3.7 GHz radio design can eliminate.
  - Building on the Report, other countries and regions are investigating further, imposing mitigations on near-band 5G operations, and issuing advisories to protect public safety.
- The imminent commencement of commercial 3.7 GHz operations underscores the need to grant the Petition for Reconsideration promptly and impose conditions on flexible use deployments and systems to preserve aviation and public safety while allowing 5G use of the C-band to move forward.

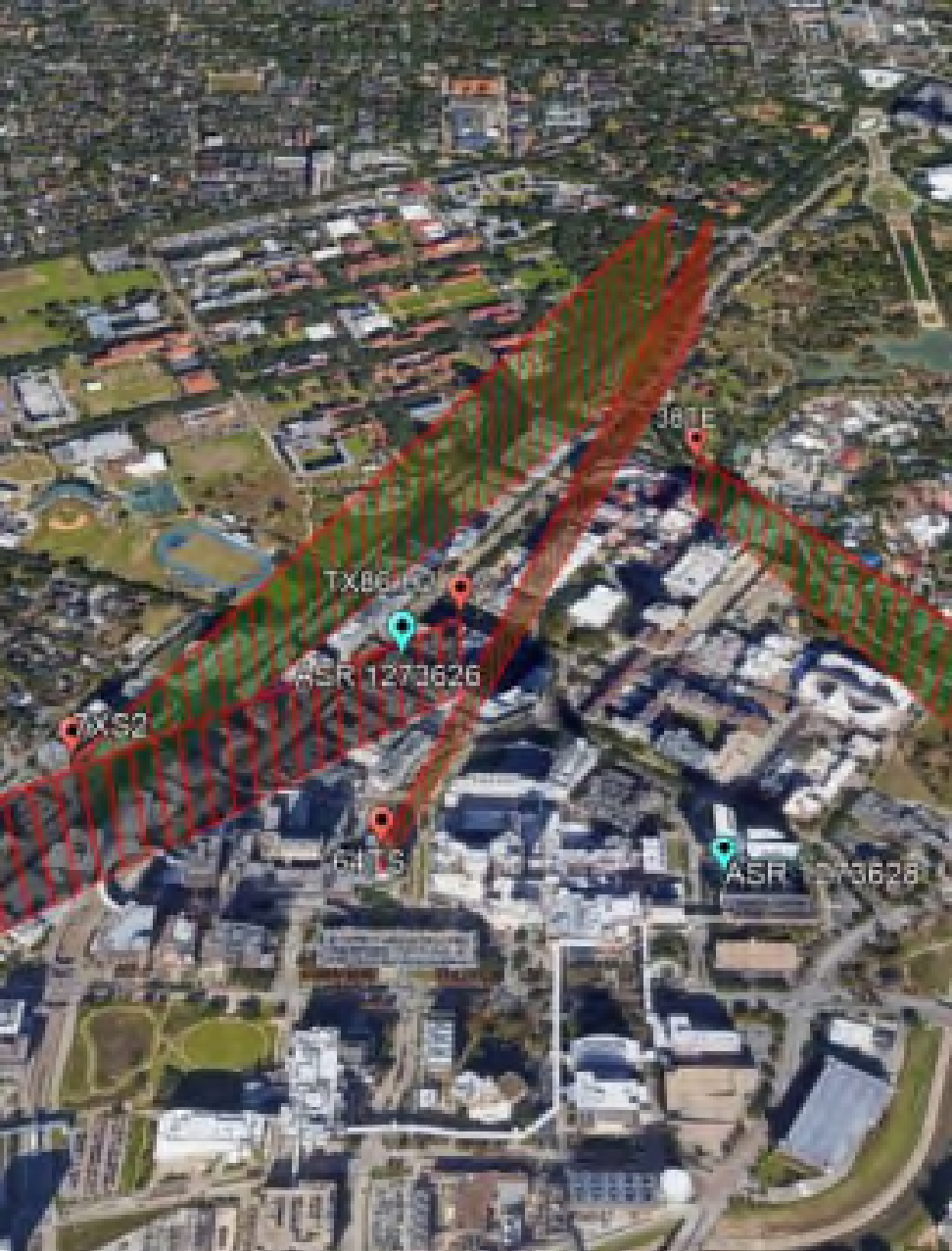
**Avoiding near- and mid-term negative impacts on the flying public, the economy, and critical services requires that the FCC, with the FAA, actively lead collaboration by the aviation and aerospace industry and 3.7 GHz licensees to find solutions.**



# The Aviation Industry Has Been Actively Examining the Mitigations It or the FAA Can Initiate

- **Retrofitting radio altimeters** with out-of-band filters in a timely fashion is a practical impossibility and does not offer a comprehensive solution to mitigate the risks.
- **Operator-initiated limitations** would severely disrupt the National Airspace System; training would have limited effectiveness and cannot overcome loss of safety offered by reliably-functioning radio altimeters.
- **FAA options** – issuance of Notices to Airmen, adoption of Airworthiness Directives, or taking Air Traffic mitigations – would result in material reductions to aviation operational capacity impacting the traveling public, critical services, and the economy.

**Aviation and the FAA cannot alone address the interference 3.7 GHz operations will cause: the FCC and the flexible use licensees are also essential parts of the solution.** <sup>3</sup>



## Real-World Impact of Radio Altimeter Interference on Helicopter Air Ambulance

- The Texas Medical Center in Houston which consists of 21 hospitals has four heliports within two square miles:

Baylor St. Luke's (64TS)	Texas Children's (7XS2)
Memorial Hermann (38TE)	Houston Methodist (TX86)

- At least two currently deployed (for 4G LTE service) mobile wireless base station are within a few blocks of the heliports.
- If these base stations are upgraded to 5G, the interference thresholds for radio altimeters are expected to be significantly exceeded throughout the entire approaches for all heliports which would seriously impact patient care

**5G base stations, without implementing mitigations to protect altimeters, have the potential to wreak havoc on the use of heliports at hospitals and in medical centers.**



# The Numbers Suggest High Likelihood of 5G Interference with Helo Operations

## US Helicopter Statistics

- **10,199** active rotorcraft<sup>1</sup>
- **2.99 million** flight hours annually, almost all at low altitudes<sup>1</sup>

## US Heliport Statistics

Industry estimates a total of between **6,533** and **8,533** Helicopter Air Ambulance (HAA) landing sites.

- **5,869** active heliports, of which **2,533** are medical use<sup>2</sup>
- NASA estimates upwards of **2,000** hospital heliports **NOT** accounted for in FAA database<sup>3</sup>
- Approximately **2,000-4,000** Predesignated Emergency Landing Area (PELA) sites **NOT** accounted for in FAA database or NASA estimate<sup>4</sup>

## HAA Statistics

- Over **550,000** patients in the US use air ambulance services every year<sup>5</sup>
- **399,051** hours flown by air ambulance helicopters in 2019<sup>6</sup>
  - **163,635** HAA hours flown at night in 2019
  - **126,791** HAA Scene Response Flights (i.e., to non-heliport/non-PELA locations) in 2019

<sup>1</sup> As of 2020, [https://www.faa.gov/data\\_research/aviation\\_data\\_statistics/general\\_aviation/CY2019/](https://www.faa.gov/data_research/aviation_data_statistics/general_aviation/CY2019/)

<sup>2</sup> As of Jul 15, 2021, [https://www.faa.gov/airports/airport\\_safety/airportdata\\_5010/#importer](https://www.faa.gov/airports/airport_safety/airportdata_5010/#importer)

<sup>3</sup> As of 2019, NASA Aviation Safety Reporting System (ASRS) report. ACN: 1599969

<sup>4</sup> Helicopter industry estimate As of August 2021

<sup>5</sup> As of 2018, <https://www.ama-assn.org/system/files/2018-12/i18-cms-report2.pdf>

<sup>6</sup> As of 2019, [https://www.faa.gov/about/plans\\_reports/congress/media/Air\\_Ambulance\\_Operation\\_s\\_Data\\_2019\\_PL\\_115-254\\_Sec314d.pdf](https://www.faa.gov/about/plans_reports/congress/media/Air_Ambulance_Operation_s_Data_2019_PL_115-254_Sec314d.pdf)

**UC3 approaches to many of the thousands of U.S. heliports and countless offsite locations have a significant likelihood of being impacted unless the “mitigation gap” is addressed.**

# Airliner or GA AUTOLAND, Visual or Low Visibility “CAT II/III”



Radio altimeters perform many important functions in AUTOLAND, VFR, or Low Visibility scenarios; compromising any of those can have cascading and expansive adverse impacts on UC1 and UC2 air operations.

1

2

3

4

5

6

1

Prior to approach, pilots select the approach in the Flight Management System – includes “Decision Height” (e.g. 100’ radar altitude).

2

Selecting a different approach is disabled below a certain radar altitude; manual tuning of the ILS system may be locked out below certain radar altitudes.

3

Once a CAT II Autoland approach starts, loss of radar altimeter data usually requires the approach to be abandoned (missed approach).

4

Autopilot sensitivity on ILS beam reduces with radar altitude, as ILS Localizer beam width narrows.

5

At the specified Decision Height, the pilot must have the runway touchdown zone in sight or execute a missed approach.

6

AUTOLAND will transition to Flare and Rollout modes at about 100’ radar altitude.

# Airliner or GA Visual Approach and Landing



**Even in good weather, interference to radio altimeters on UC1 and UC2 approaches would likely result in adverse impacts on air operations.**

1 At 2500', radar altitude display active

2 At 2300', Predictive Wind Shear activates (deactivates at 50')

3 From 1550' – 1000', Traffic Alert Collision Avoidance System (TCAS) alerts change.  
At 900' TCAS Resolution Advisories are inhibited (not shown due to lower priority).

4 At/below about 800', many status and caution messages are inhibited to prevent distraction during landing; other warnings may be enabled at these altitudes (e.g. landing gear not down). *(Note: similar warning changes during takeoff)*

5 At 200', "rising runway" symbol and landing visual cues are shown on flight instruments and Heads-Up Display / automatic altitude callouts to touchdown – e.g., 50, 40, 30, 20, 10 and "rising runway" animation.

6 At about 100', some aircraft may transition to a "Flare and De-rotation" flight control law for enhanced handling qualities. Radar altitude is also used in the arming and activation of ground spoilers, thrust reversers, and other landing systems.



# Windshear Encounter and Escape

- Windshear is a weather phenomenon that causes aircraft to experience a rapid decrease in airspeed, due to wind flows near the ground.
  - Hazardous** during takeoff and landing
- Upon encountering a windshear, the Pilot Flying executes a manual “escape maneuver”: pitch to a nose-up attitude and increase engines to full power.
  - Escape maneuvers often happen at low altitudes.
- Aircraft can still **lose altitude** during the escape maneuver.
- The Pilot Monitoring continuously **calls out radar altitude** to give the Pilot Flying critical situational awareness to help with decision making to avoid ground contact.

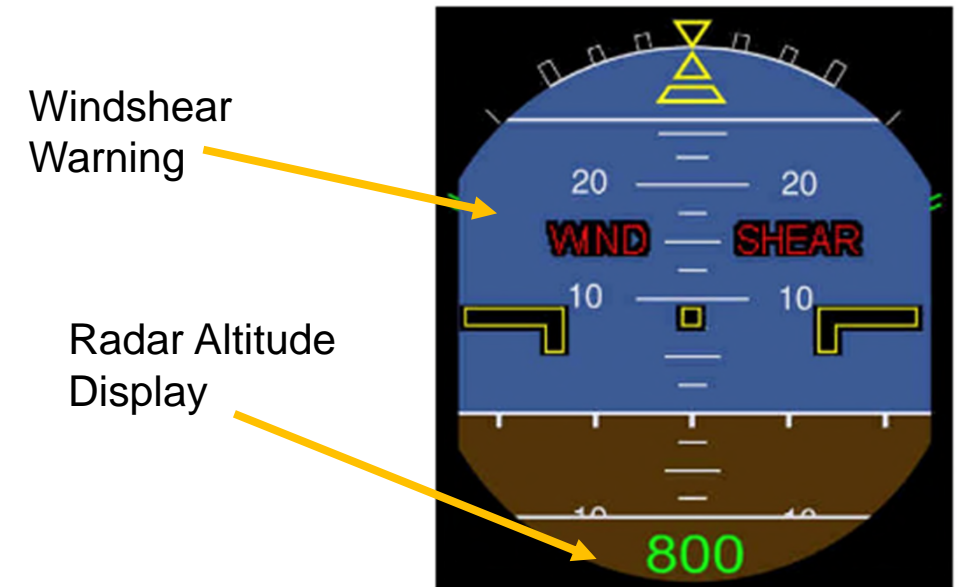
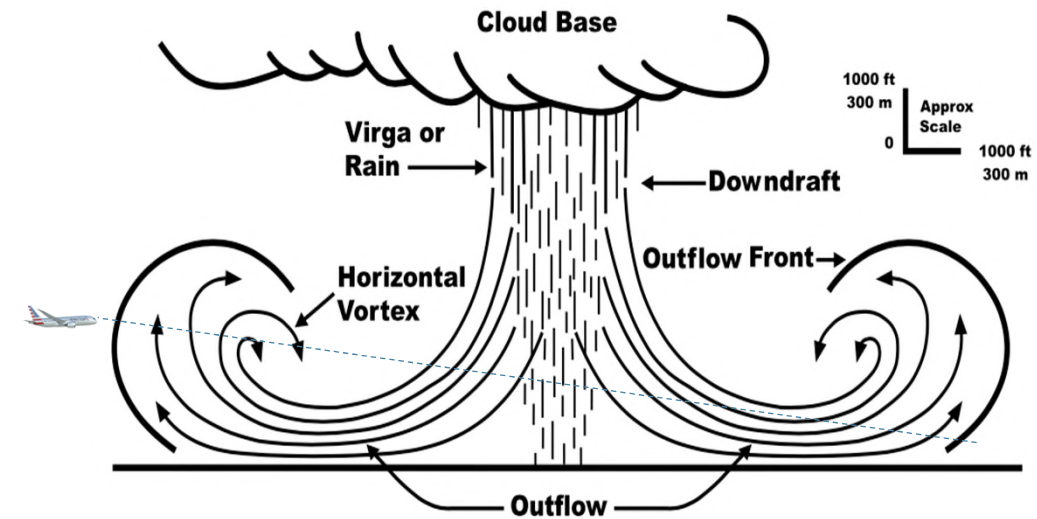


Image Credit:  
Airbus

**Loss of, or incorrect, radar altitude during the escape maneuver due to interference would greatly reduce chances of a successful safe outcome.**



## Bottom Line and Essential Next Steps

- Absent the FCC's and the commercial mobile wireless industry's immediate collaboration with the aviation and aerospace industry and the FAA, major disruptions to passenger air travel, commercial transport, and critical helicopter operations can be expected from the rollout of 5G under the Commission's Order.
- There is still time to avoid such public harms by building on the foundation that the aviation and aerospace industry has created, including its initial set of proposed 3.7 GHz mitigations.
- The FCC should grant the pending Petition for Reconsideration to codify effective solutions or impose adequate conditions on 3.7 GHz licenses.

**The aviation and aerospace industry ask the FCC promptly to convene (jointly with the FAA) discussions involving it and the flexible use licensees with the goal of rapidly developing solutions allowing 5G to advance without inflicting undesired impacts on use of the National Airspace System.**